

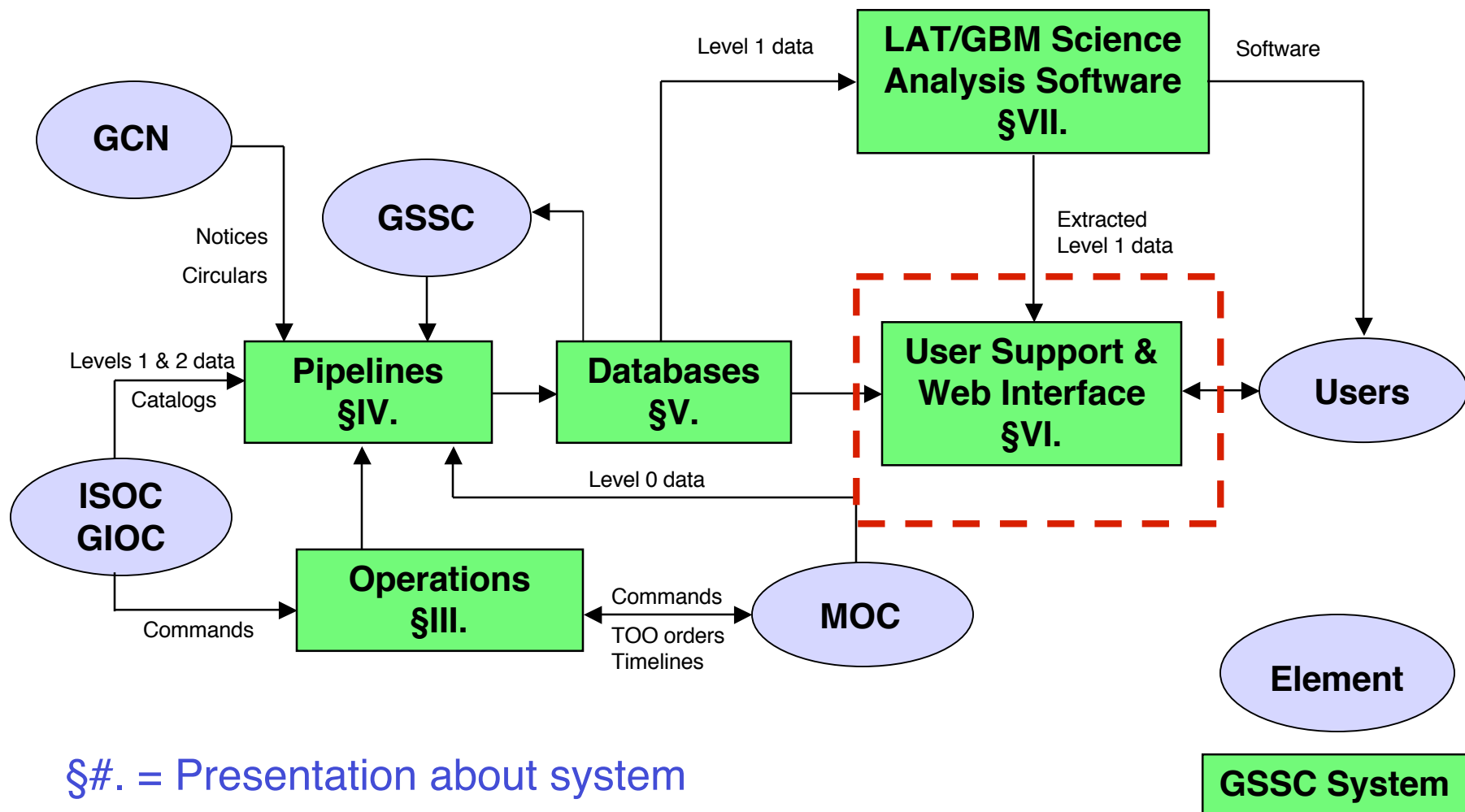


VI. USER SUPPORT

David Band – GSSC



GSSC Software Systems





Outline

- Overview
- Areas—requirements are included
 - GI Program
 - Proposal Tools
 - SAE Tool Delivery
 - Helpdesk
 - TOO
 - LAT Observation Requests
 - Posting Mission Data
- Section Development Team
- Schedule



Overview

- The User Support section assists the scientific community:
 - Analyze GLAST data
 - Prepare Guest Investigator (GI) Proposals
- This section also runs the GI Program for NASA HQ:
 - NASA Research Announcement (NRA) development
 - Proposal administration
 - Technical evaluation



Overview, cont.

- Changes from last peer review:
 - Requirements have been refined (RFA #8, described below)
 - Tool definition has been simplified, with use of SAE software identified
 - Tools renumbered to S-XY where X indicates the category

X	Category
0	Proposal preparation
1	Timeline Posting
2	Proposal Submission
3	TOO
4	LAT Observation Request
5	Information Posting
6	Helpdesk

- Interactions with other sections have been resolved



Section RFAs

- **RFA #2**—asked what operating systems will ultimately be supported, and questioned whether the analysis software should be delivered only from the HEASARC website.
 - All operating systems supported by OGIP will be supported
 - Software delivery through the GSSC website early in the mission makes sense because of software development cycles

The RFA is **closed**.

- **RFA #8**—requested refinement of the GSSC requirements, and a study of the traces to and from the FRD. The refinements are described below. The study of traces found new traces to the GSRD, gaps in the GSRD, and changes that should be made in the MSS. The RFA is still **open**.
- **RFA #16**—questioned the 2 step GI proposal process. This process is actually easier for both the GIs and the program administrators. The RFA is **closed**.

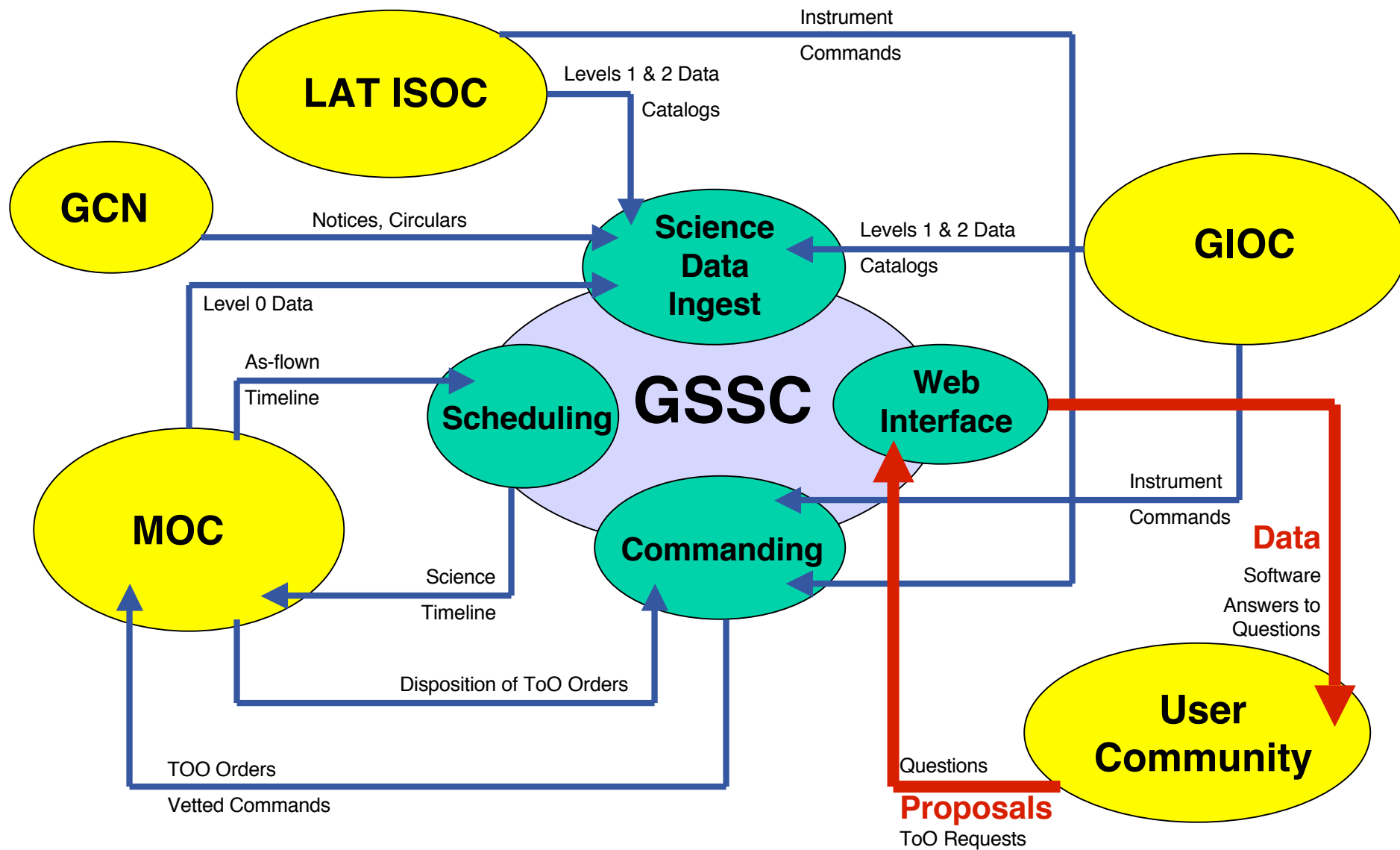


Documents

- GSSC Functional Requirements Document (FRD, 433-RQMT-0002)—the primary requirements document
- GSSC Verification Matrix (GSSC-0002)—verification of these requirements
- GSSC Design Document (GSSC-0003)—designs
- Other relevant documents are:
 - GLAST Project Data Management Plan (433-PLAN-0009)
 - GSSC Development Plan (GSSC-0001)
 - Science Data Products ICD
 - Operations Data Products ICD



GI Program





Guest Investigator (GI) Program—Time Periods

- The mission has 3 phases:
 - Phase 0—the ~60 day checkout period after launch
 - Phase 1—the 1 year sky survey while instrument teams calibrate their instruments. Except for observations of transients, the data are restricted to the instrument teams and a small number of GIs.
 - Phase 2—the rest of the mission until deorbit. The GI program drives the observations, although survey mode will probably predominate.
- There will be yearly GI cycles. Cycle 1 and Phase 1 will coincide and only ~a dozen GIs will be selected. ~100 GIs will be selected in each subsequent cycle.
- A GLAST Fellows Program is planned.



The GI Program—Administration

- We plan to administer the GI program using standard LHEA procedures (see FRD §5.3). We are consulting with the Guest Observer Facility (GOF) managers in LHEA.
- We anticipate that most proposals will only request funding since survey mode will meet most data requirements. This was true for BATSE proposals in the CGRO GI program.
- The following slide shows the anticipated schedule relative to the cycle beginnings. Note that for a February 1, 2007, launch:
 - NRA development—10/1/05
 - NRA release—5/15/06 (∴ Included in ROSS-06)
 - Proposal deadline—8/15/06
 - Peer review—11/15/06
 - Cycle begins—4/1/07

GI Program Schedule—ROSS Version

	Cycle 1	Subsequent Cycles
Begin NRA Legal Text	Tied to calendar yr	Tied to calendar yr
HQ Review of NRA	Tied to calendar yr	Tied to calendar yr
Begin NRA Appendices	T_0 -15 months	T_0 -12 months
Effective NRA Release	T_0 -10.5 months	T_i -9 months
Proposal Deadline	T_0 -7.5 months	T_i -6 months
Peer Review	T_0 -4.5 months	T_i -4 months
Notification of Rejections	T_0 -4 months	T_i -3.5 months
Timeline Meeting	T_0 -3.5 months	T_i -3 months
Request Funding Prop.	T_0 -3 months	T_i -2.5 months
Funding Proposal Due	T_0 -1.5 month	T_i -1 month
Funding Decision	T_0 -1 month	T_i -0.5 month
Beginning of Cycle	$T_0=L+60$ days	T_i
End of Cycle	T_0+1 year	T_i+1 year



GI Program Schedule—Non-ROSS Version

	Cycle 1	Subsequent Cycles
Begin NRA Development	T_0 -18 months	T_i -14 months
HQ Review of NRA	T_0 -14 months	T_i -12 months
NRA Release	T_0 -10.5 months	T_i -9 months
Proposal Deadline	T_0 -7.5 months	T_i -6 months
Peer Review	T_0 -4.5 months	T_i -4 months
Notification of Rejections	T_0 -4 months	T_i -3.5 months
Timeline Meeting	T_0 -3.5 months	T_i -3 months
Request Funding Prop.	T_0 -3 months	T_i -2.5 months
Funding Proposal Due	T_0 -1.5 month	T_i -1 month
Funding Decision	T_0 -1 month	T_i -0.5 month
Beginning of Cycle	$T_0=L+60$ days	T_i
End of Cycle	T_0+1 year	T_i+1 year



The GI Program—2 Step Process

- A two step proposal process will be used: the funding proposal will be submitted only if the science proposal has been accepted. The NASA Program Scientist has approved this.
- **RFA #16** questioned this. However, preparing the budget, getting signatures, etc., is a major inconvenience that might deter proposers, particularly if the success rate is not high.
- In reality, funding tends to be driven by the size of the project, not the real needs of proposers. Proposers usually request the expected average grant size.
- Thus an estimate of the proposers' funding request in the science proposal will suffice.

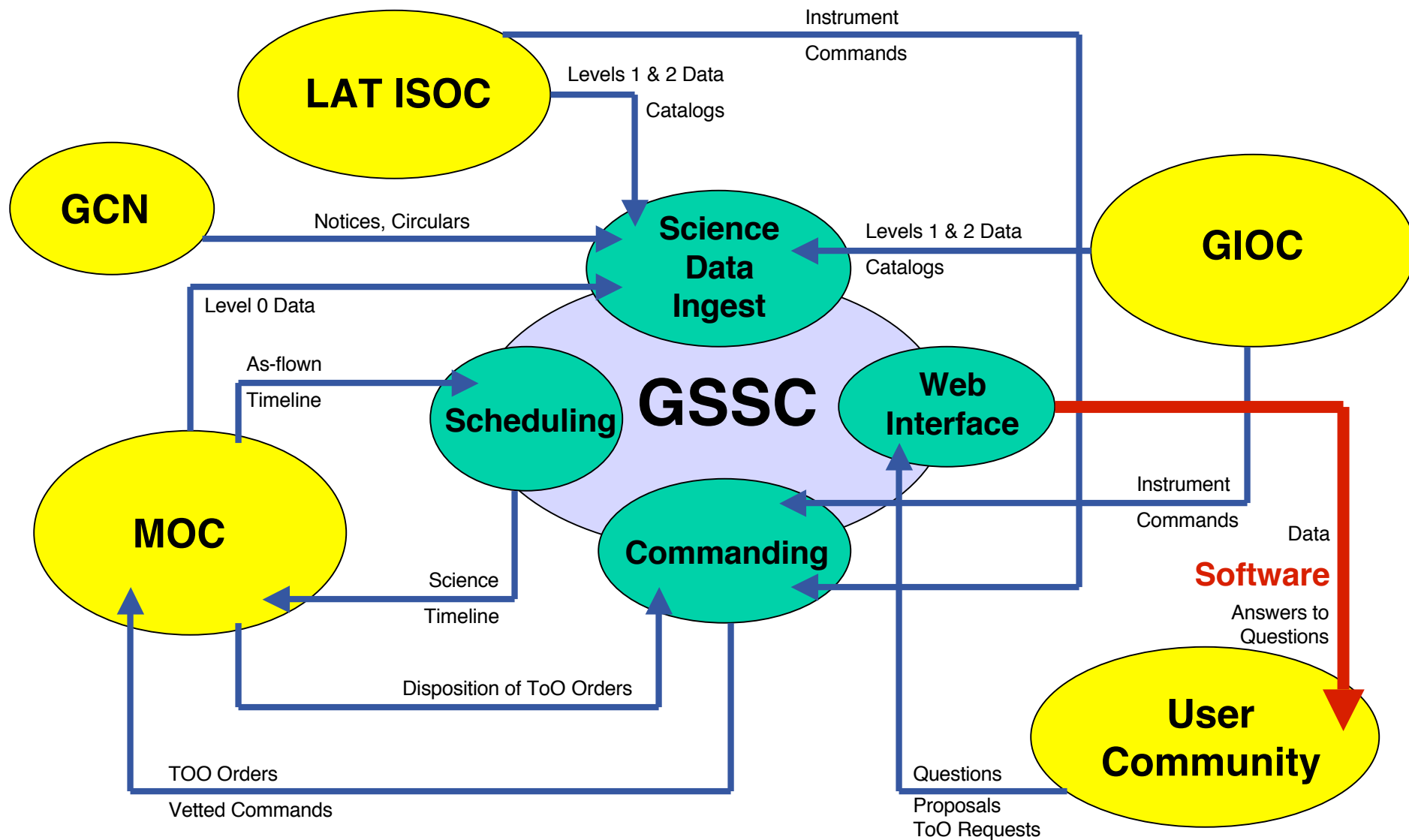


GI Program Administration Tools

- Proposal information will be submitted using OGIP's Remote Proposal System (RPS), customized for GLAST (in our tool nomenclature S-21). Target information entered through RPS will ultimately be transferred electronically to the scheduling tool.
- The scientific justification will be FTPed to a GSSC server.
- Abstracts of successful proposals will be accessible through a BROWSE interface (FRD §5.3.2.9).
- OGIP software and services will assist in administering the peer reviews.



Proposal Tools





Proposal Preparation Tools—Requirements

RFA #8 requested more detailed proposal preparation requirements. The following in **red** have been added to the FRD:

5.3.2.1 Tools for Preparing Proposals—The **GSSC** shall provide software, sensitivity tables and other tools to assist with the preparation of the proposals.

5.3.2.1.1 Different Accuracy and Generality Levels—The proposal preparation tools shall provide proposers with different levels of accuracy and generality in planning their proposals.

5.3.2.1.2 Multimission Comparisons—The proposal preparation tools shall permit comparisons of the fluxes in different gamma-ray detectors. For example, a tool will predict the LAT photon flux from an EGRET detection.

5.3.2.1.3 Orbit Fidelity—GLAST's orbit shall be modeled by the proposal preparation tools with varying fidelity. For example, the simplest model will be a precession-averaged orbit while the most sophisticated will predict GLAST's location as a function of time.



List of Proposal Preparation Tools

One Tool

ID	Name	Description	Code reuse
S-01a	Source Name Resolver	Resolves standard source names in to coordinates using NED and SIMBAD	Perl scripts available
S-01b	Background Estimator	This tool estimates the background flux from the diffuse Galactic and extra-galactic emission from a given point or region on the sky.	May use SAE code.
S-01c	Exposure Calculator	This tool calculates the rate at which exposure is accumulated (e.g., cm ² -s per day) for a point on the sky. Trade studies will determine whether the exposure accumulation rate depends significantly on the orbit precession phase.	
S-01d	??PIMMS	This tool calculates the expected count rate for a given source and a given mission. Input may be the source parameters from another mission.	PIMMS
S-01e	Sensitivity Calculator	This tool uses the background, the source count rate and the exposure accumulation rate to calculate the time for a source detection, for significant variability, etc.	
S-02	Exposure Analyzer	Reads in pointing history (FT2) and plots exposure map and history. Can be used to evaluate past, future and proposed observations	May use SAE code.
S-03	Orbit Simulator	Simulates an orbit with an observation plan	SAE's O1 with web interface
S-04	Observation Simulator	Simulates an observation of a given region	SAE's O2, no additional interface
S-05	Simulated spectral analysis A	Permits user to simulate the 1D spectral analysis of a source.	XSPEC, no additional interface
S-06	Simulated spectral analysis B	Permits user to simulate the 3D (spectral+spatial) analysis of a source.	Likelihood , no additional interface
S-07	GBM Simulated Spectral Analysis	Simulates the spectral analysis of a burst observed by the GBM.	XSPEC, no additional interface

Identification of salient features of this design shown next.



Different Accuracy and Generality Levels

One Tool

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S-06	Simulated spectral analysis B	Permits user to simulate the 3D (spectral+spatial) analysis of a source.	Likelihood, no additional interface
S-07	GBM Simulated Spectral Analysis	Simulates the spectral analysis of a burst observed by the GBM.	XSPEC, no additional interface

Color groups related software.



Multimission Capability

ID	Name	Description	Code reuse
S-01a	Source Name Resolver	Resolves standard source names in to coordinates using NED and SIMBAD	Perl scripts available
S-01b	Background Estimator	This tool estimates the background flux from the diffuse Galactic and extra-galactic emission from a given point or region on the sky.	May use SAE code.
S-01c	Exposure Calculator	This tool calculates the rate at which exposure is accumulated (e.g., $\text{cm}^2 \text{ s}$ per day) for a point on the sky. Trade studies will determine whether the exposure accumulation rate depends significantly on the orbit precession phase.	
S-01d	PIMMS	This tool calculates the expected count rate for a given source and a given mission. Input may be the source parameters from another mission	PIMMS
S-01e	Sensitivity Calculator	This tool uses the background, the source count rate and the exposure accumulation rate to calculate the time for a source detection, for significant variability, etc.	
S-02	Exposure Analyzer	Reads in pointing history (FT2) and plots exposure map and history. Can be used to evaluate past, future and proposed observations	May use SAE code.
S-03	Orbit Simulator	Simulates an orbit with an observation plan	SAE's O1 with web interface
S-04	Observation Simulator	Simulates an observation of a given region	SAE's O2, no additional interface
S-05	Simulated spectral analysis A	Permits user to simulate the 1D spectral analysis of a source.	XSPEC, no additional interface
S-06	Simulated spectral analysis B	Permits user to simulate the 3D (spectral+spatial) analysis of a source.	Likelihood, no additional interface
S-07	GBM Simulated Spectral Analysis	Simulates the spectral analysis of a burst observed by the GBM	XSPEC, no additional interface



Orbit Fidelity

ID	Name	Description	Code reuse
S-01a	Source Name Resolver	Resolves standard source names in to coordinates using NED and SIMBAD	Perl scripts available
S-01b	Background Estimator	This tool estimates the background flux from the diffuse Galactic and extra-galactic emission from a given point or region on the sky.	May use SAE code.
S-01c	Exposure Calculator	This tool calculates the rate at which exposure is accumulated (e.g., $\text{cm}^2\text{-s}$ per day) for a point on the sky. Trade studies will determine whether the exposure accumulation rate depends significantly on the orbit precession phase.	
S-01d	??PIMMS	This tool calculates the expected count rate for a given source and a given mission. Input may be the source parameters from another mission.	PIMMS
S-01e	Sensitivity Calculator	This tool uses the background, the source count rate and the exposure accumulation rate to calculate the time for a source detection, for significant variability, etc.	
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RFA #13

- **RFA #13** was concerned with the availability of the calibration data to support the proposal preparation tools. However, the instrument teams develop and distribute instrument response functions (IRFs) as part of the 3 data challenges (the GBM will participate in data challenges #2 and #3). The GSSC is intimately involved in these data challenges, and already has preliminary (IRFs) for both instruments. The IRFs are used in CALDB with OGIP-standard FITS formats.
- **RFA #13** was also concerned that the HEASARC was loath to include a background in PIMMS. Indeed, the overall calculation requires the diffuse background model, but the γ PIMMS segment will only calculate the source flux.

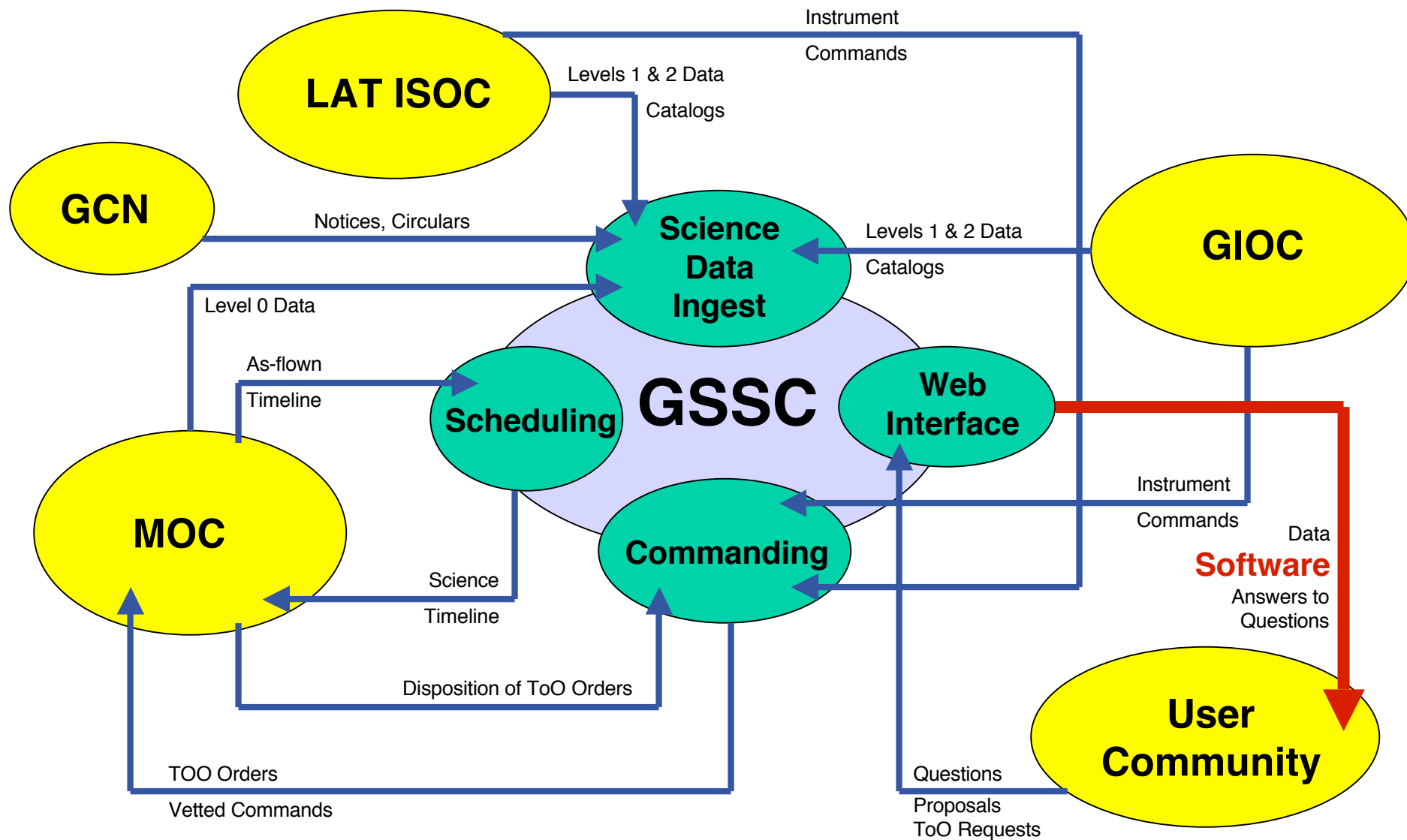


Proposal Preparation Tools—Supporting Calculations

- Both scientists and programmers will work on the proposal preparation tools because the tools will require supporting calculations and trade studies.
- The S-01c Exposure Calculator will use tables for the rate at which exposure is accumulated.
 - The tables need to be calculated.
 - A trade study will determine whether the orbit precession makes a difference; if so, additional tables will be necessary.
- Average RMFs and backgrounds for both the LAT and the GBM are required for spectral analysis simulations using XSPEC.
 - A trade study will determine the relative accuracy of XSPEC and Likelihood analyses.
- The sensitivities of different gamma-ray missions are required for γ PIMMS.



SAE—Tool Delivery





Standard Analysis Environment (SAE)

- As described in §VII.B, users will analyze data using the Standard Analysis Environment (SAE—FRD §5.5).
- **RFA #2** was concerned about the supported platforms; in brief, a full port to all FTOOLS-supported platforms, including Windows, will be performed before launch (see §VII.B).



Delivery of the SAE

- Users will download the SAE to their servers (FRD §5.5.3). using the HEASARC distribution software for UNIX platforms. A similar methodology will be developed for Windows.
- Initially, the software will be downloaded from the GSSC website (with links from the HEASARC website), while later in the mission it will be downloaded from the HEASARC website (with links from the GSSC website).
- **RFA #2** advocated software downloading from the HEASARC website only. However, in the early years of the mission the SAE's update releases will be more frequent than that of the more mature standard FTOOLS suite. Therefore it is prudent to keep the SAE software in the GSSC until later in the mission.

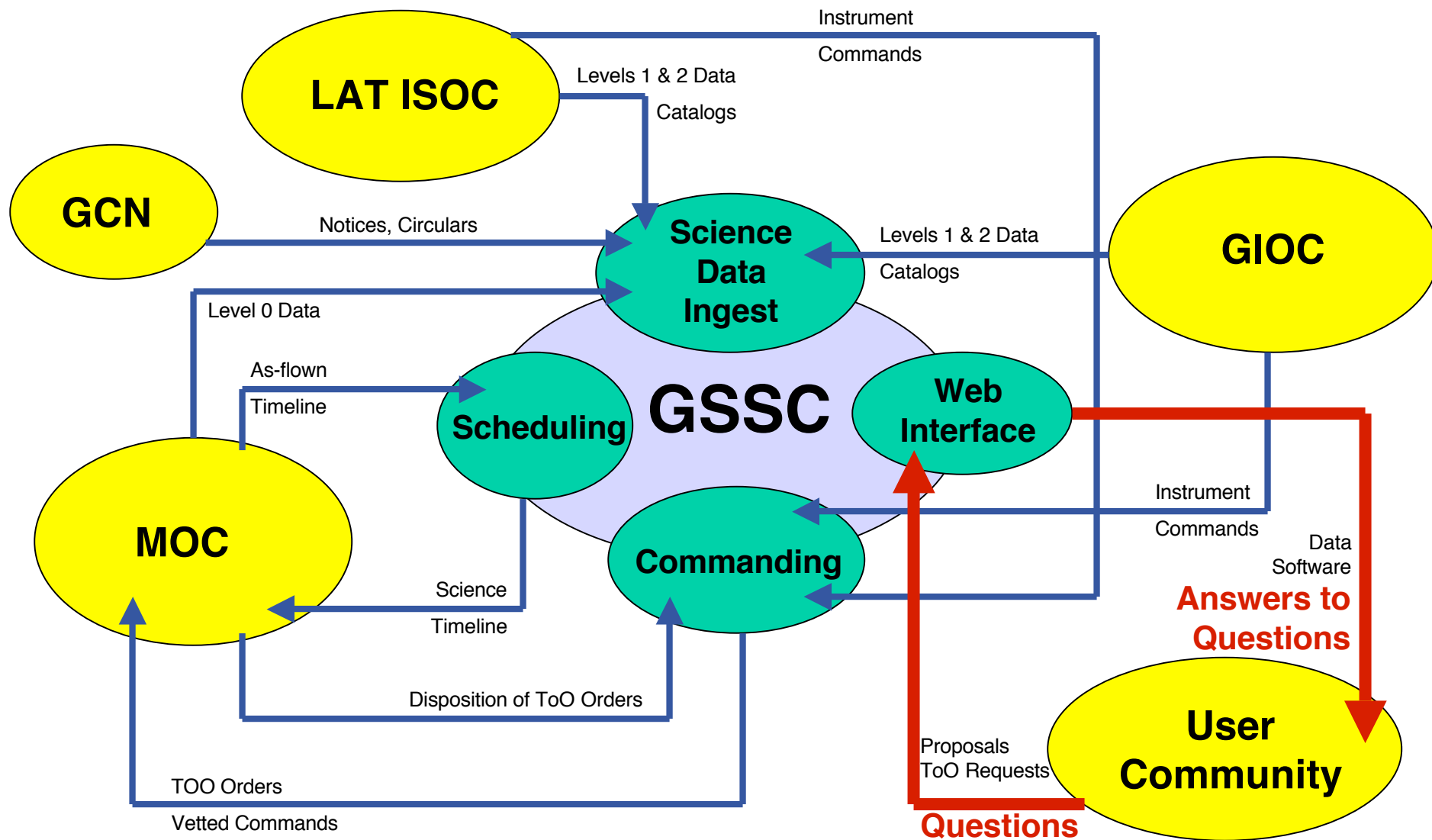


Documentation

- Clear documentation (FRD §5.5.2) is crucial for the success of the SAE.
- Tool developers will contribute preliminary documentation of their tools.
- The documentation will evolve during the data challenges (i.e., the drivers are the data challenges and the GI program).
- A manual will be developed based on this documentation.
- All GLAST scientists and the Users' Committee will be asked to review the manual.
- User Support will also assist users through a helpdesk (discussed next)



Helpdesk





Helpdesk

- In addition to copious on-line documentation, the GSSC will answer user questions through a ‘helpdesk.’
- **RFA #8** was concerned about the absence of ‘helpdesk’ requirements, particularly regarding response times and the ability to track the response time.
- Therefore we added to the FRD (in **red**):

5.3.3.3.1 Helpdesk—The **GSSC** shall respond to investigator’s queries submitted electronically. **This will be called the ‘helpdesk’.**

5.3.3.3.2 Helpdesk Response Time—The GSSC shall respond within 2 business days.

5.3.3.3.3 Monitoring Helpdesk Response Time—The helpdesk system shall monitor and report the response time.

5.3.3.3.4 Logging Helpdesk Queries—The investigator queries and the GSSC responses will be logged.

5.3.3.3.5 FAQ—A ‘Frequently-Asked-Questions’ (FAQ) section of the web-based documentation shall be extracted from the helpdesk queries.



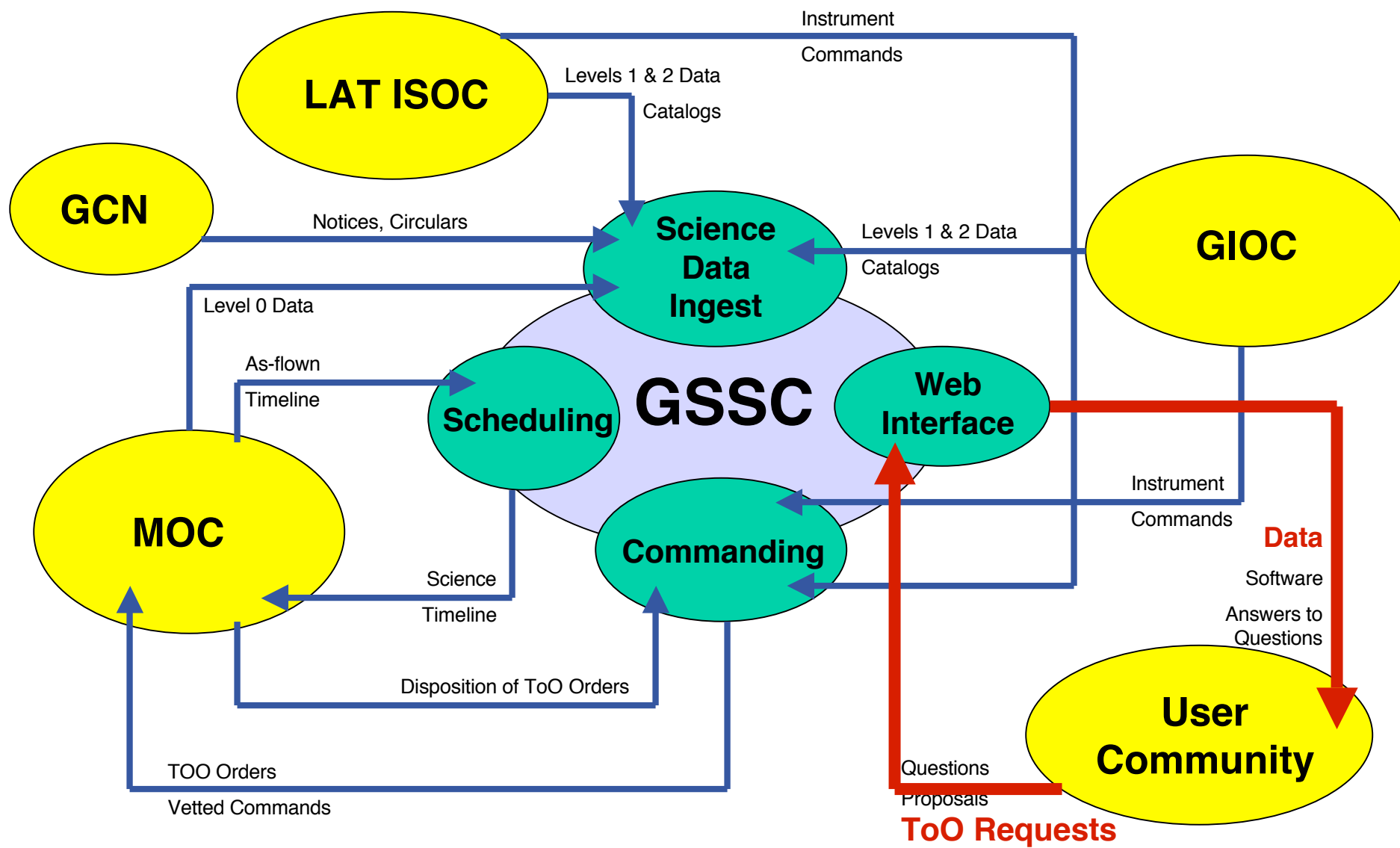
Helpdesk Tools

ID	Name	Description
S-61	Help Desk Question Submission	Enables users to submit questions about GLAST analysis to the GSSC via a webform.
S-62	Help Desk Response Administration	Transfers the questions submitted via the GSSC helpdesk (S -61) to duty scientists responsible for answering them, tracks the response time, archives subsequent correspondence.
S-63	FAQ Access	Enables the website user to browse and search the list of frequently asked questions compiled from the GSSC helpdesk submissions.

- This software already exists for S-61 and S-62.



TOO Tools



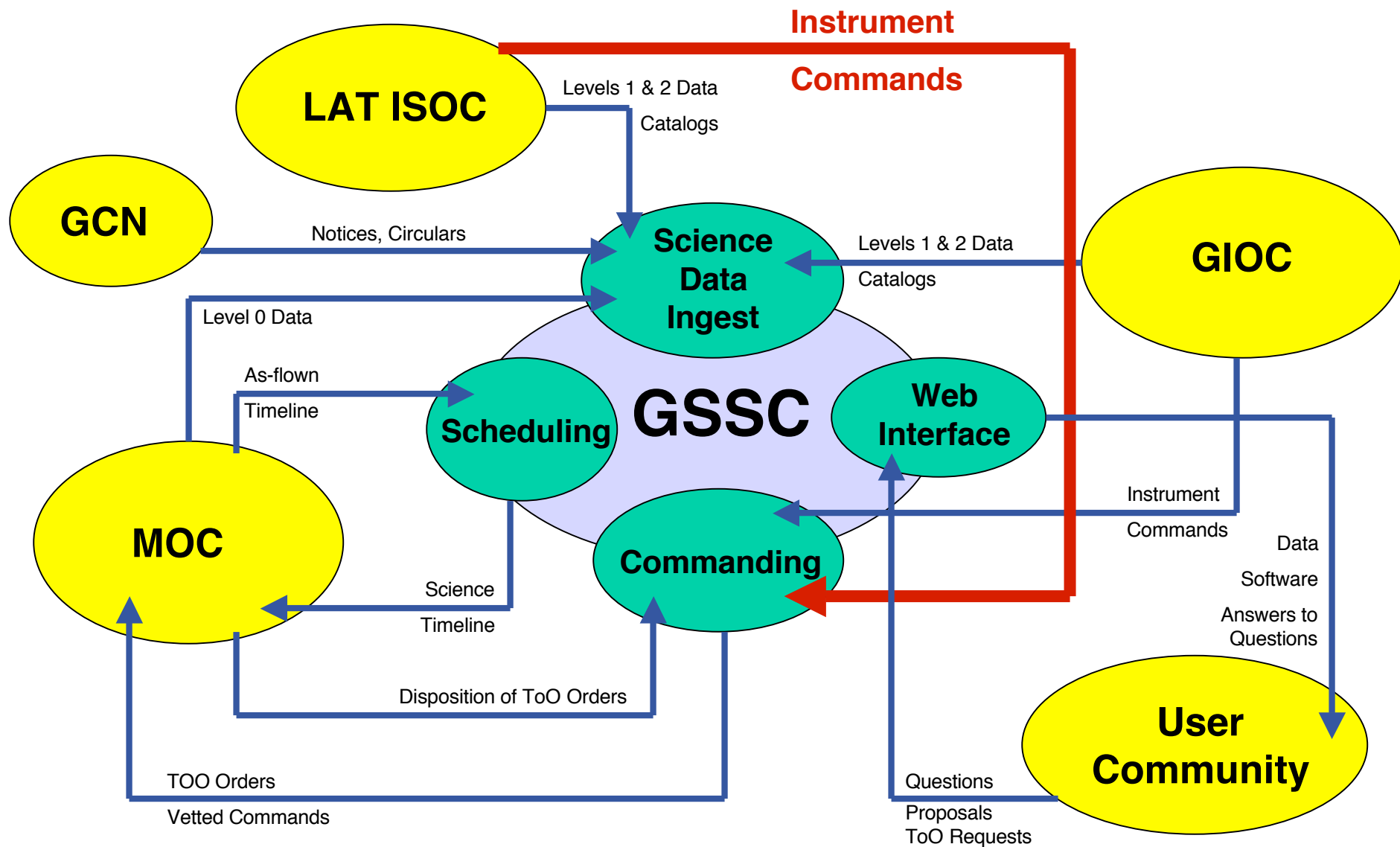


Target of Opportunity (TOO) Tools

- The GSSC is required to receive TOO requests (FRD §5.4.1.5.1), notify the requester of the ‘execution results’ (FRD §5.4.1.5.7) and in general inform the public of GLAST mission results (FRD §5.4.2). TOO’s are expected ~once per month.
- Therefore, the GSSC will receive TOO requests through a customized RPS form (S-31) that will allow the requester to justify the request, and to input the source’s coordinates and the requested TOO duration. Target information entered through RPS will be transferred electronically to the TOO order tool. RXTE uses this methodology.
- Once the TOO has been approved, the GSSC’s submission of the TOO order to the MOC will trigger the posting of the TOO’s approval to the GSSC website (S-32). The TOO webpage will be updated with the results of the TOO.



LAT Observation Requests



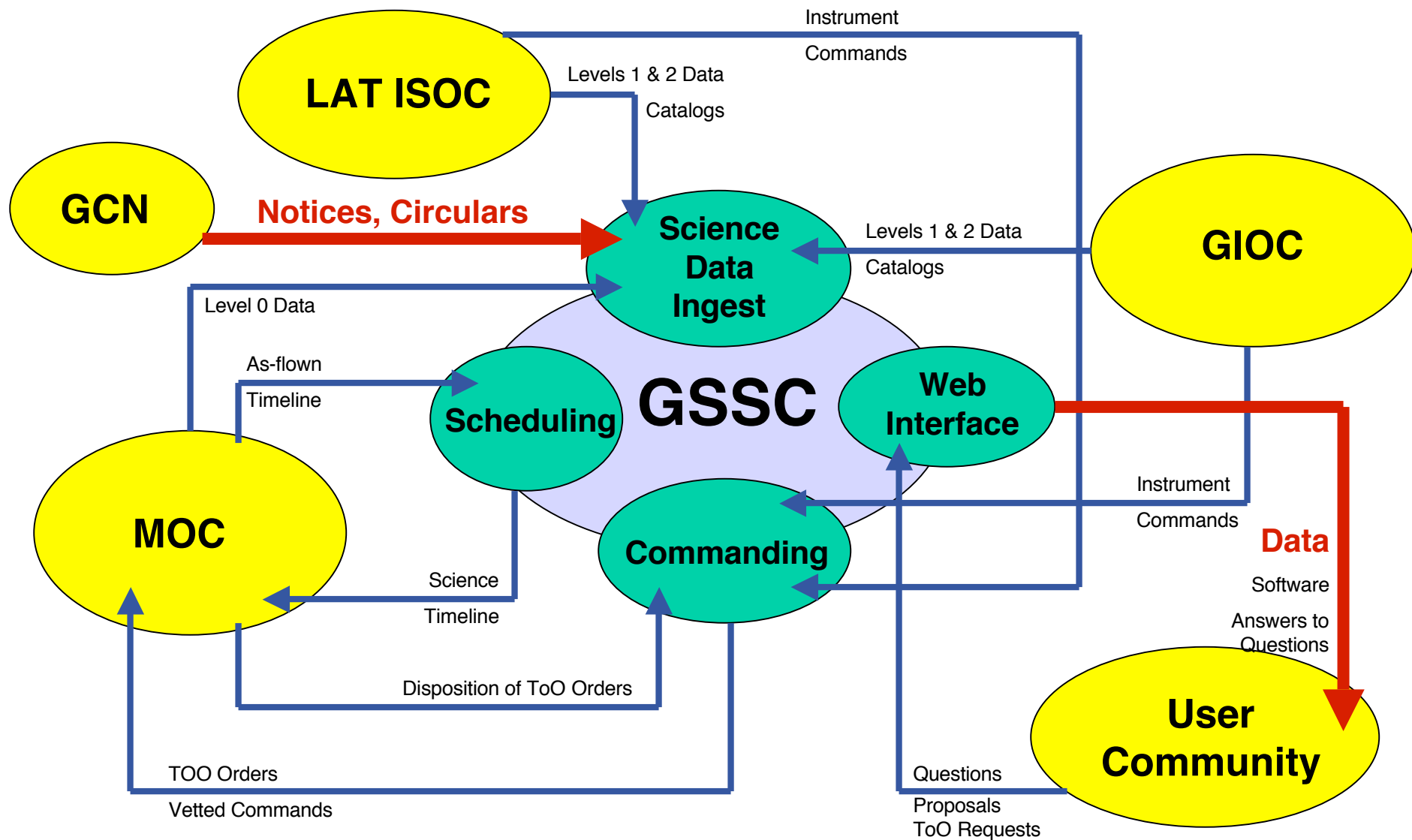


LAT Observation Requests

- The GSSC will create science timelines based on:
 - Phase 1—the LAT's verification and survey needs
 - Phase 2—the GI program; however, the LAT may need calibration observations
- The LAT will communicate its requests for calibration observations through a customized RPS webpage (S-41). The target and name of any associated command file will be entered through the RPS webpage, and the information can then be transferred electronically to the scheduling tool.



Posting Mission Results





Posting Mission Results

- The GSSC is required to “post on its public website information related to the GLAST mission and its results” (FRD §5.4.2).
- Many of the GLAST data products—e.g., Level 1 data and catalogs—will be in databases accessed through BROWSE (see §V.B.v). The posting of these data is NOT described here.
- Here is described the posting of:
 - Timelines
 - Count Maps
 - Exposure Maps
 - Maps of the Diffuse Emission
 - GRB Data



Posting Timelines

- The GSSC is required to post past and future timelines (FRD §5.4.1.3).
- Therefore, the GSSC will post:
 - Annual science timelines (planned observations for 1 year with 1 week resolution)
 - Preliminary science timelines (covers 1 week, created ~month in advance)
 - Final science timelines (covers 1 week, created a few days in advance)
 - As-flown timelines (covers 1 week).
- Ingest of these timelines will trigger the posting; therefore the latency should be hours.

ID	Name	Description
S-11	Weekly Timeline Display	Posts the weekly science timelines
S-12	Annual Timeline Display	Posts the annual science timeline
S-13	As-Flown Timeline Display	Posts the as-flown timeline



Timelines and Exposure

- These timelines are simple lists of when the observatory was/will be in survey mode, and if in pointed mode, what was/will be the target.
- But users might want to know when a source was/will be observed and how much exposure was/will be accumulated.
- The LAT pointing/lifetime history, a LAT Level 1 data product, reports the spacecraft position and LAT pointing with 30 s resolution. The FITS file type is called FT2.
- The S-02 Exposure Analyzer tool (included in the proposal preparation tools above) will read an FT2 file and produce an exposure map for a desired space and time range, AND an exposure timeseries for a particular point on the sky.



Timelines and Exposure

Therefore:

- The LAT data product provides the exposure history for the past.
- Production of preliminary and final science timelines will include corresponding FT2 files, providing a prediction of the exposure history for up to a month in the future.
 - A user will then know precisely when his/her source will be observed by GLAST.
- A user can run S-03 Orbit Simulator (the SAE tool O1) with a desired pointing, producing an FT2 file.
 - Note that the accuracy of any orbit simulation diverges.



Posting Scientific Results

The GSSC is required to post mission results (FRD §5.4.2). Some of these postings are regular products—exposure and count maps (FRD §5.6.4)—that will be created regularly (e.g., weekly, monthly, yearly), while other postings will be triggered by the ingest of the relevant data products.

ID	Name	Description
S-51	Count Map Generator	Generates count maps. The tool will be run periodically by a software pipeline.
S-52	Exposure Map Generator	Plots the exposure map for the entire sky and select regions. The tool will be run periodically by a software pipeline.
S-53	LAT Diffuse Emission Display	Displays the current diffuse emission model
S-54	GRB Map Display	Creates and displays map of GRB locations
S-55	GRB Lightcurve Display	Displays a lightcurve for each GRB
S-56	GCN Post	Receives, archives and posts on a webpage GLAST GCN Notices and Circulars.



Regular Production Posting

- Periodically counts and exposure maps will be posted for the entire sky and select regions (e.g., the Galactic Center, the anti-Center).
- S-51 may use SAE tools.
- S-52 will use S-02 Exposure Analyzer.

ID	Name	Description
S-51	Count Map Generator	Generates count maps. The tool will be run periodically by a software pipeline.
S-52	Exposure Map Generator	Plots the exposure map for the entire sky and select regions. The tool will be run periodically by a software pipeline.
S-53	LAT Diffuse Emission Display	Displays the current diffuse emission model
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S-55	GRB Lightcurve Display	Displays a lightcurve for each GRB
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GRB Pages

- Every burst will have its own webpage(s) with:
 - Lightcurves; posting of the GBM lightcurve will be automated
 - All the GLAST-produced GCN Notices and Circulars (FRD §5.7.1.8)
- A map with the burst locations will also be posted.

ID	Name	Description
S-51	Count Map Generator	Generates count maps. The tool will be run periodically by a software pipeline.
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Section Development Team

- Section manager: David Band
- Staff:
 - Jerry Bonnell—Scientist (part time)
 - JD Myers—Web design (part time)
 - Programmer (new hire)
- GSSC staff will participate in testing as described in §VII.C.



Schedule—Principles

- The GI program is the driver for the User Support tools:
 - The proposal submission tool, the helpdesk tools, and the proposal preparation tools must be ready when the NRA is released
(L-10.5 month = mid-May 2006 \Rightarrow GSSC Release 6 on 4/3/06)
 - The display tools are not required until there are data after launch
(GSSC Release 7 on 1/31/07).
- The release schedule reflects this driver.
- If tools are ready before their release date, they may be used in the GRTs; their availability when the corresponding simulated data are ingested would be a nice touch.



Release Schedule

ID	Name	GSSC Release	ID	Name	GSSC Release
S-01	Source Sensitivity Calculator	6	S-32	Approved ToO Display	7
S-02	Exposure Analyzer	7	S-41	LAT Observation Request Interface	6
S-03	Orbit Simulator	6	S-51	Count Map Generator	7
S-04	Observation Simulator	SAE	S-52	Exposure Map Generator	7
S-05	LAT Simulated Spectral Analysis A	SAE	S-53	LAT Diffuse Emission Display	6
S-06	LAT Simulated Spectral Analysis B	SAE	S-54	GRB Map Display	7
S-07	GBM Simulated Spectral Analysis	SAE	S-55	GRB Lightcurve Display	7
S-11	Weekly Timeline Display	7	S-56	GCN Post	3
S-12	Annual Timeline Display	7	S-57	Point source monitor	NA
S-13	As-Flown Timeline Display	7	S-61	Help Desk Question Submission	6
S-21	GI Proposal Submission Interface	6	S-62	Help Desk Response Administration	6
S-31	ToO Proposal Submission Interface	5	S-63	FAQ Access	6



Schedule Relief—Existing Tools

- S-01a—Perl scripts exist for Source Name Resolver
- S-01b—The SAE includes code for accessing the diffuse emission model
- S-01d—Based on PIMMS
- S-02—The SAE includes code for calculating the exposure
- S-03, S-04, S-05 and S-06—Included in SAE
- S-21, S-31, and S-41—RPS
- S-57—GSSC will inherit the source monitoring tool from the LAT team (if GSSC takes over monitoring in Phase 2)
- S-61 and S-62—Helpdesk tools already developed

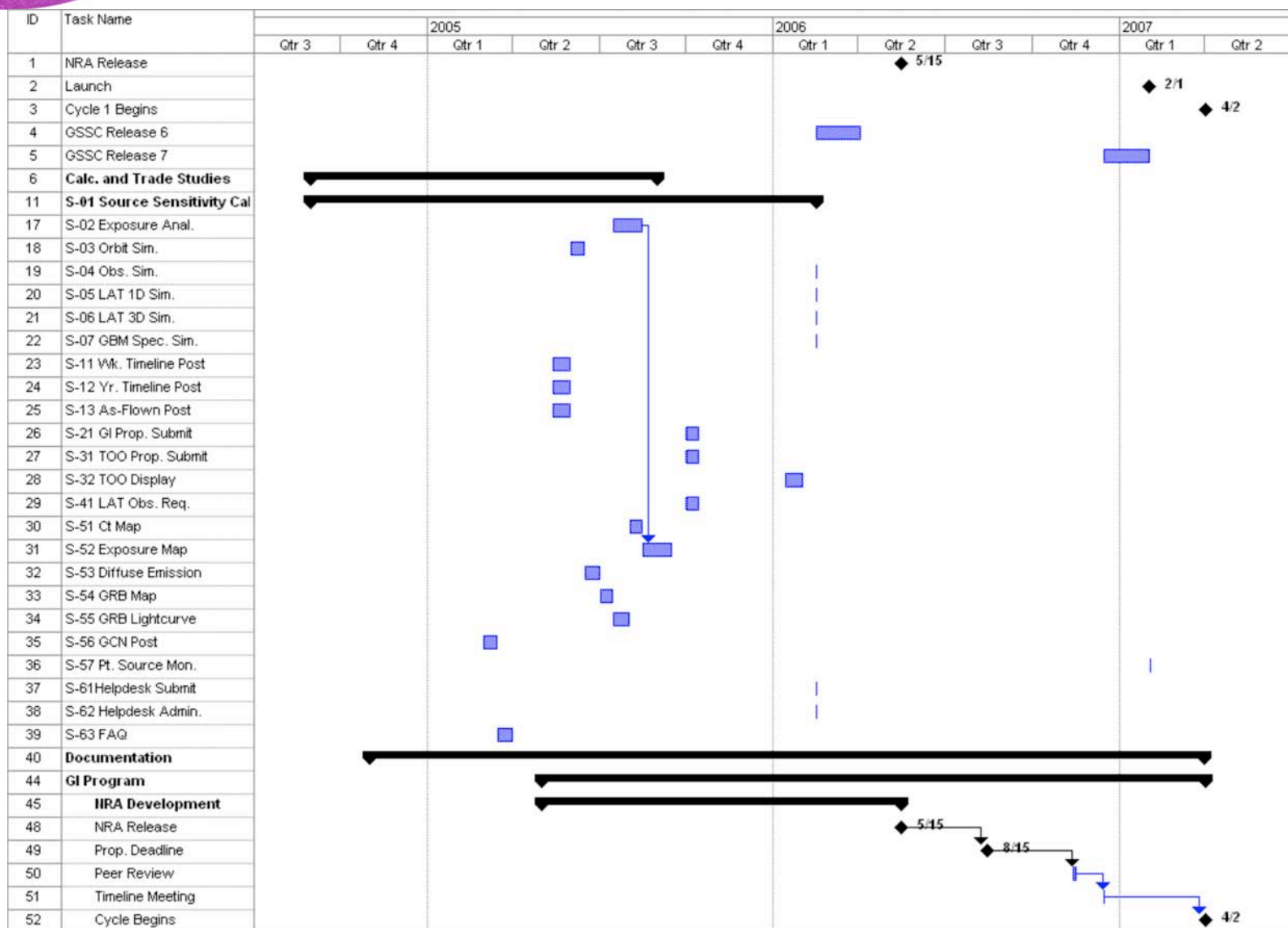


Schedule—Text

- User Support will require a great deal of text.
- NRA
 - I will develop the text for inclusion in ROSS-06 in '05.
 - I will develop, collect or edit the bulk of the NRA and appendices in early '06 for release 5/15/06
- Software documentation
 - Tool developers will contribute documentation, particularly before each DC
 - I will supervise the editing of the documentation into a manual
 - Early drafts for DC2, DC3 and the NRA release
 - Further drafts before launch

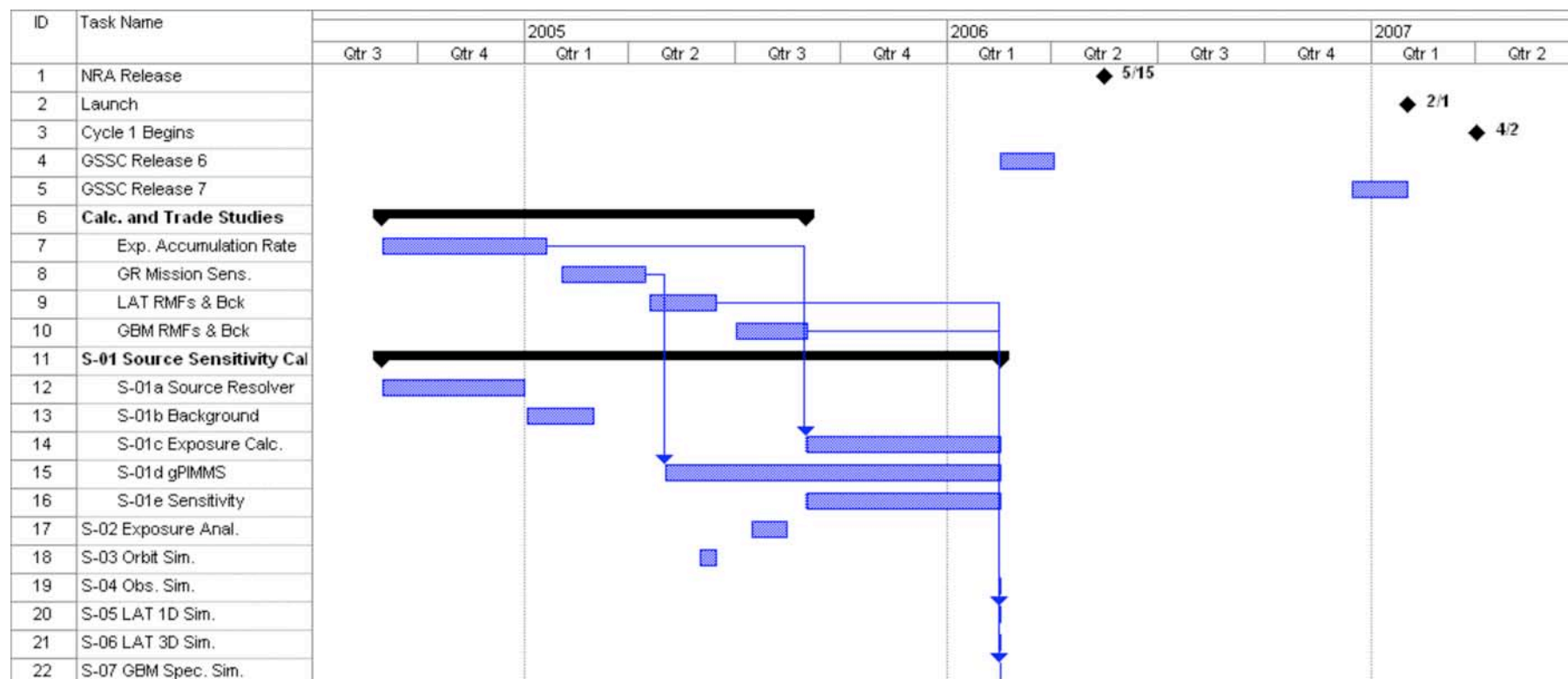


Schedule—All (details below)





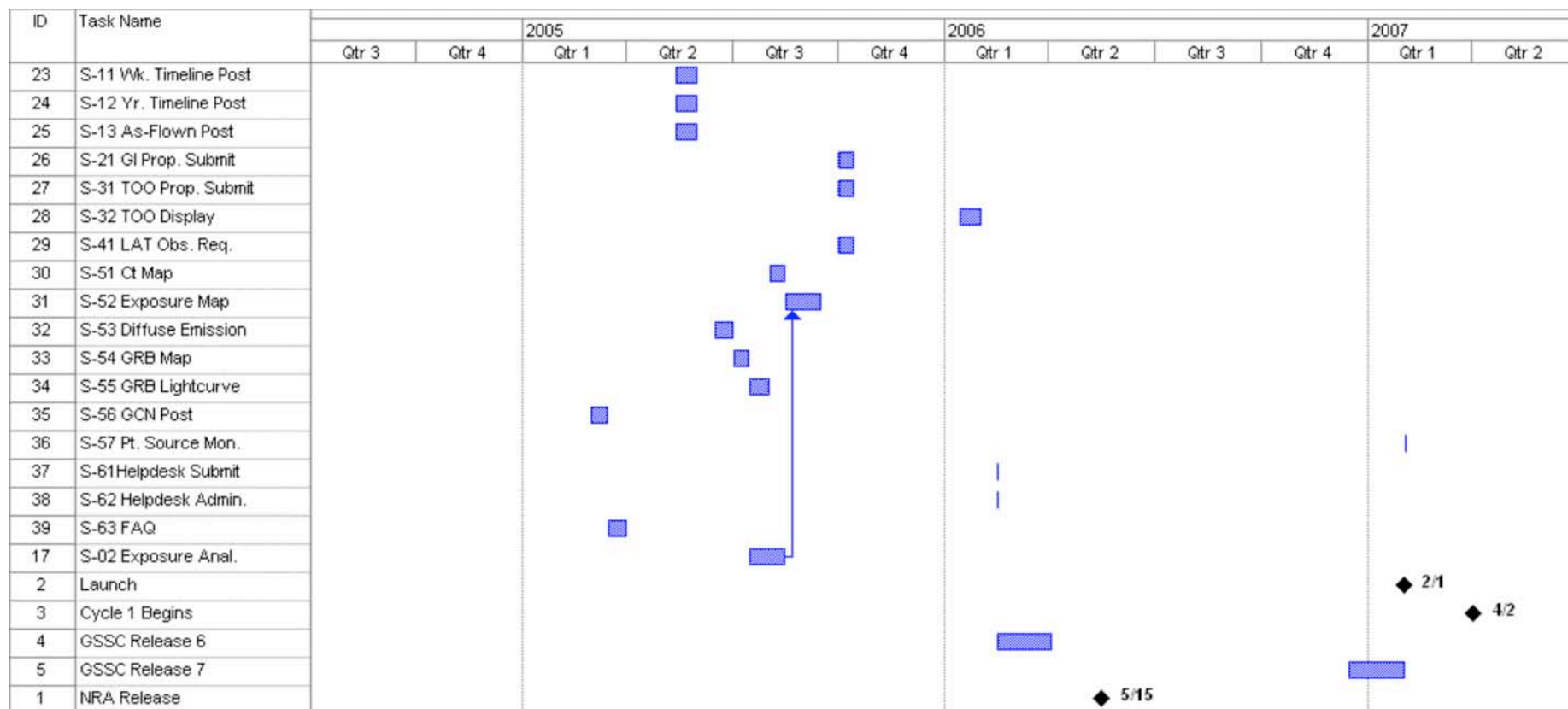
Schedule—Proposal Preparation Tools



- These tools must be ready for the NRA release (5/15/06)
- Calculations and trade studies are required



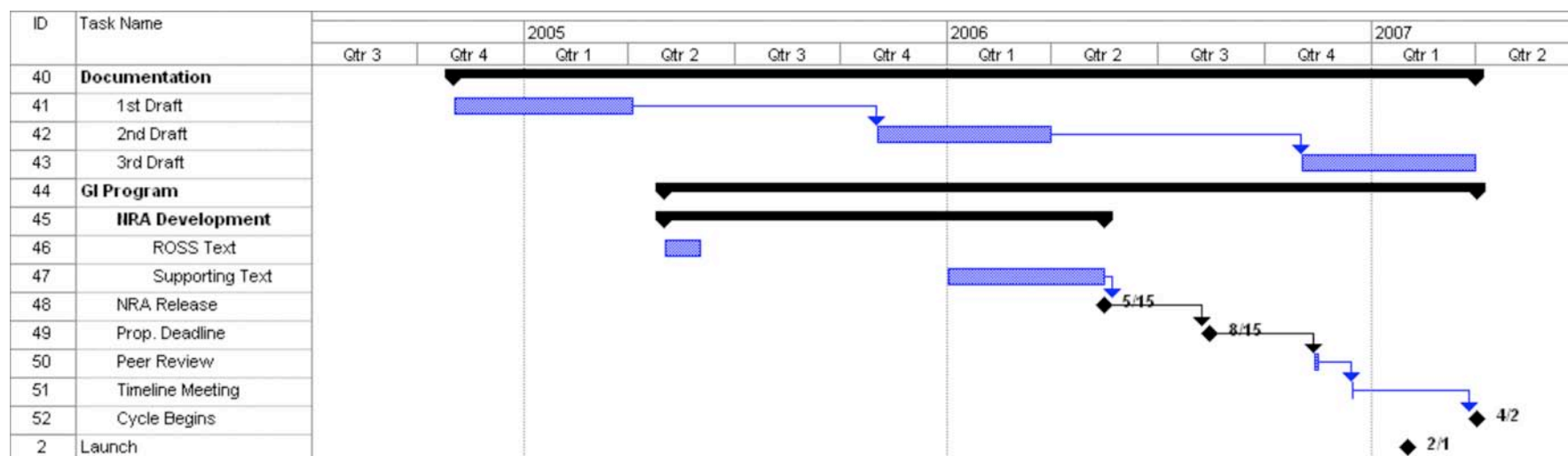
Schedule—Other Tools



Note that most of tool development is in 2005. Even though the GI program is the formal driver, posting tools will be useful for the GRTs.



Schedule—GI Program and Documentation



- Documentation will be driven by the data challenges, the NRA release and the beginning of the 1st GI cycle.
- NRA development assumes GI program in ROSS-06.



Summary

- The requirements in the User Support area have been refined.
- The RFAs in this area have been addressed.
- The list of User Support tools has been simplified, and the use of SAE tools and code identified.
- Interactions with other sections have been resolved.
- Development of the NRA and documentation will be a major activity.